

**EXPERT REBUTTAL
OF
BYRON H. SHAW, Ph.D.

TO THE EXPERT REPORT
OF
SCOTT N. STEPHEN, CCA, NRCS-TSP**

*Community Association for Restoration of the Environment, Inc.
and Center for Food Safety, Inc.*

v.

Cow Palace, LLC, The Dolsen Companies, and Three D Properties, LLC

Docket No. 2:13-cv-3016-TOR

Prepared for:

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“CONFIDENTIAL” under the Stipulated Protective Order (ECF No. 82)*

1. I, Byron Shaw, have been retained by Plaintiffs in the above-captioned matter to provide expert testimony about the manure management, storage, and application practices of Defendant Cow Palace Dairy, LLC (“Cow Palace” or “Defendant”). As part of this role, I have been asked by Plaintiffs to review, and rebut portions of, the expert report of Scott N. Stephen (the “Stephen Report” or “Report”).

2. The Stephen Report opines that the use of manure as a nitrogen source is “very complex” and that application to crops is “not an exact science.” In my opinion, the use of manure as a nitrogen source is well-understood and studied; there is a great deal of literature explaining the dangers of over-applying manure to fields and the need to ensure that application rates provide the right amount of nutrients for crops to use as fertilizer, but no more. In fact, Cow Palace’s DNMP describes how the Dairy should calculate agronomic rates based on timely, complete data and realistic crop yield goals. Thus, I disagree with Mr. Stephen’s later opinion that, due to the number of factors involved in nitrogen availability from manure, “its use as a fertilizer cannot be considered an exact or precise endeavor.” Instead, modern-day science combined with adherence to a sound nutrient budget makes achieving an agronomic rate of application more than achievable.

3. Mr. Stephen states that manure has been used as a valuable fertilizer

source for centuries, and that manure is a primary supply of nitrogen for crops. I agree, but note that manure has *not* been produced in such concentrated quantities or applied to agricultural fields at such high rates for centuries. Instead, it is only the recent advent of large industrial-sized farms that has seen nitrogen generation and application skyrocket. CAFOs like Cow Palace Dairy produce many orders of magnitude more manure than the smaller, pasture-based dairies of the last generation. The critical difference is that Cow Palace does not have sufficient land to make agronomic use of all that manure, as demonstrated by, among other things, the consistently high post-harvest soil tests from its fields, Plaintiffs' own sampling, and the nitrate contamination of the local groundwater.

4. The Stephen Report spends three pages discussing the "other benefits" of using manure as a fertilizer. I have seen absolutely no evidence or testimony from Cow Palace personnel that the Dairy has ever managed its manure applications in an attempt to achieve these other "benefits" from manure in its fields. Instead, my review of Cow Palace's information indicates that the Dairy applied manure to its fields as a means of getting rid of it, considering that the Dairy had the tools, instructions (in the DNMP), and knowledge (based on Jeff Boivin's testimony) to calculate agronomic rates, yet failed to ever undertake such calculations. Thus, even when faced

with high post-harvest soil sample results that showed more than enough nitrogen, phosphorus, and potassium for fertilization of the next crop, Cow Palace proceeded to apply *more* manure to its fields. Such non-agronomic applications of manure demonstrate that Cow Palace was spreading manure to empty its lagoons, not to achieve a realistic crop yield.

5. Furthermore, the consistently high post-harvest soil samples taken from Cow Palace's fields – discussed at length in my expert report – have a detrimental impact on soil quality. Soil biota are harmed by the presence of excessive amounts of nitrogen and phosphorus; the NRCS 590 standard specifically recognizes that elevated phosphorus levels are detrimental to soil biota. That cow manure contains pharmaceutical byproducts from the drugs provided by Cow Palace to its herd further undermines the Stephen Report's claims about the alleged other benefits of manure application. Additionally, as Cow Palace's experts admit, Cow Palace must frequently over-irrigate its fields to drive the salts that are present in cow manure deeper into the soil profile to allow for crop growth. Just like how salts have a negative impact on crops, they also have a similar negative effect on soil biota, soil chemistry, and nutrient cycling (pushing salts deeper into the soil profile with over-irrigation also pushes excess nitrates past crop root zones).

6. Moreover, the Stephen Report opines that Cow Palace's manure

applications increase soil organic matter, which has a benefit of promoting healthy soils. I have seen no documentation that Cow Palace *ever* took into consideration the mineralization effect from the additions of soil organic matter that result from manure applications. In fact, the Dairy only determined its manure application rates, to the extent it did so at all, by comparing the maximum crop removal amounts contained in the DNMP against the total amount of nitrogen applied to the field, based on a generic, 1.5 lbs./1000 gallon nitrogen figure.

7. Thus, while manure applications at *agronomic rates* may result in a variety of other, unintended benefits, the fact is that Cow Palace has overloaded its application fields with excessive amounts of manure, causing large quantities of nitrogen, phosphorus, potassium, and other chemicals to be present in the soil column. These over-applications do not have a positive effect on soil health.

8. The crop data provided by Stephen used yields somewhat higher than I have seen for the Cow Palace fields and uses a 50% moisture content for triticale, sudan grass and alfalfa silage. These numbers are significantly higher than literature values used by the USDA crop nutrient removal web site and result in much higher estimates of nutrient removal than are likely. I have seen no moisture measurements on which to base these low moisture

values.

9. The Report opines that the “goal of any crop production system is to maximize crop yields.” I believe that this “goal” is incorrect, and not in compliance with the DNMP which states that achievable yield goals using 3-5 year averages should be used. The NRCS 590 standard uses the term “reasonable yield goals” for nutrient management. Never is the term “maximum crop yield” used as this will always result in excess nutrient additions and residuals. The DNMP Purpose states:

1.1 Purpose

The purpose of this plan is to provide the dairy manager with Best Management Practices (BMP's) for the production, collection, storage, transfer, treatment, and agronomic utilization of the solid and liquid components of dairy nutrients in such a manner that will prevent the pollution or degradation of state ground waters and surface waters. Specific purposes include:

Prevent the chance of contaminated nutrient discharge to streams, drainage ditches, or other surface waters from the dairy.

- Prevent the chance of contaminant migration from the dairy facility to the underlying aquifer.
- To agronomically recycle the nutrients produced through soil and crops.
- Meet the requirements of *The Dairy Nutrient Management Act of 1998, The Clean Water Act, and comply with Federal, State and local laws regarding water quality standards.*

10. The Report goes on to discuss the variety of definitions of the concept of “agronomic rate” in an attempt to show that there is no agreed-upon definition. The problem with Mr. Stephen’s opinion is that all of his inserted definitions share two common themes: to provide the amount of nutrients necessary to sufficiently fertilize a crop while minimizing losses of

nutrients to the environment, primarily groundwater. In fact, the stated goals of Cow Palace's DNMP are to provide nutrients to crops while avoiding contamination of surface and groundwater. I understand that the Dairy asserts that the DNMP is the "blue print" for its operations and that Mr. Boivin is intimately familiar with it.

11. The Report seems to acknowledge that the DNMP does, in fact, contain the guidance necessary to achieve agronomic rates while protecting the environment. But Mr. Stephen opines that "[e]ach dairy must make interpretations regarding how best to implement Plan elements at its own facility." Having reviewed the DNMPs for all the Defendants – which include substantial appendices that explain, among other things, how to determine soil moisture content, how to interpret soil sampling results, how to calibrate application equipment, how to maintain storage ponds, how to obtain manure nutrient samples, and how to calculate application rates, *see, e.g.,* COWPAL000508-577 – I disagree that the DNMPs are somehow open to interpretation by the Dairies. The DNMP provides most of the tools and information necessary for Cow Palace to calculate an agronomic rate and maintain a nutrient budget. In fact, Cow Palace's DNMP even includes nutrient budget worksheets and related templates that the Dairy could have used in its application process. COWPAL000572-576. Jeff Boivin,

manager at Cow Palace, testified that he understood how to calculate an agronomic application, Boivin Tr. at 226:17-227:24; 237:7-238:9, but failed to do so. Furthermore, I understand that the South Yakima Conservation District is available to provide assistance to Cow Palace about any questions it has concerning its DNMP, including how to implement it. As to the Report's statement about dairies only taking samples at the one-foot level, Cow Palace's DNMP requires that two-foot samples be taken, which the Dairy has done most of the time. Even with these more expansive tests, the Dairy still ignored the results, applying far more manure nutrients to its fields than its crops could ever uptake as fertilizer.

12. Mr. Stephen's Report also asserts that Cow Palace was not provided guidance about how to take soil samples or manure samples, and that the NMP provides little "guidance" regarding the qualifications of the person taking soil samples. From the records I have reviewed, Cow Palace had certified laboratories in the State of Washington take all of its soil samples. Certified laboratories have trained personnel to obtain soil samples. I have not seen any documentation from "fertilizer salesmen" recommending more application of fertilizer, nor have I seen any records evidencing that Cow Palace purchases or makes use of artificial fertilizer.

13. The Stephen Report next discusses how Cow Palace's manure is

managed and applied pursuant to the requirements of the Administrative Order on Consent (“AOC”). The AOC requires Cow Palace’s fields to be managed in such a way that soil nitrate levels are at or below 45 ppm at the two-foot depth of the soil column post-harvest. My opinion is that there is no scientific basis for this 45 ppm limit, for that amount of nitrate located in the two-foot depth is susceptible to leaching to groundwater, especially post-harvest in the fall, because crops use less nitrate as fertilizer in the winter months and therefore excess nitrate is likely to leach past crop root zones with additional precipitation and snowmelt. This 45ppm target is equivalent to between 157 and 190 pounds per acre of nitrate in this depth range alone, which is more than enough for any fall crop planted by Cow Palace. Nitrate in the upper foot is more likely to be used first as root development will not likely reach the second foot until the middle of the next growth season.

14. Mr. Stephen opines that the steps Cow Palace has taken under the AOC are reducing soil nitrate levels in Cow Palace’s fields. In particular, four of Cow Palace’s fields tested above 45 ppm soil nitrate at the two foot level in Fall 2013; only one of those fields tested above the 45 ppm limit in Spring 2014. Based on my review of records, however, I believe that Cow Palace’s manure applications even under the AOC have not been agronomic. For instance, Cow Palace’s sampling of Field 1 in May 2014 showed that the

top three feet of the soil column had 333 lbs./ac nitrate available for crop use, more than sufficient to fertilize the corn crop planted that year.


COWPAL015740. Soil organic matter mineralization from manure carryover will add to this amount available for crop growth. This additional amount of available nitrogen is consistently ignored. Despite this, Cow Palace still applied manure to the field, adding 2,562,000 gallons of manure to Field 1 during the summer of 2014. COWPAL015790. These cannot be said to be agronomic applications, for the corn crop did not need additional nitrogen fertilizer. Similar non-agronomic applications under the AOC are discussed in my expert report.

15. Furthermore, I believe that much of the decrease in nitrate levels observed in Cow Palace's fields over the winter months since the AOC has been implemented cannot be attributed to crop removal from the triticale crop, but instead is likely due to additional leaching below the crop root zones. For instance, the 2014 triticale yield for Field 1 was only 6.53 tons/ac, which according to the USDA Nutrient Removal tool likely only removed in the range of 68.5 to 81.6 lbs./ac nitrogen. Similar results are seen for Field 2, as discussed in my expert report.

16. The implementation of the Irrigation Water Management Plan should improve and reduce leaching losses if followed by the farm managers.

There will still, however, be leaching losses from irrigation used to reduce salt build up in the soils and overwinter excess of precipitation over evaporation will provide additional downward movement of water and nutrients. For this reason, it is important that the 45 ppm nitrate goal be reduced significantly. The nitrate level should never exceed 25 ppm at the two-foot depth or there will be leaching losses exceeding the nitrate groundwater standard. Even at 25 ppm, some nitrate loss to groundwater will continue to occur.

Dated: October 20, 2014


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